

# Digital Elevation Models of Rhode Island and Southern Massachusetts: Procedures, Data Sources, and Analysis

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Prepared for the National Tsunami Hazard Mitigation Program (NTHMP) by the NOAA National Centers for Environmental Information (NCEI)

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## Summary

In October of 2018, NOAA's National Centers for Environmental Information (NCEI) developed integrated bathymetric–topographic digital elevation models (DEMs) according to specifications developed jointly by NOAA NCEI and the United States Geological Survey (USGS) to help better define a consistent elevation mapping framework for the nation (Eakins et al., 2015; Table 1). Thirteen DEM tiles were created in the area of interest at resolution of 1/9 arc-seconds integrating topography and bathymetry. The DEM tiles represent best available data at the time of their creation; the intent is to update specific tiles as new source data becomes available. The utilization of a tiling scheme in developing the DEMs is intended to improve data management during source data processing as well as facilitate targeted DEM updates.

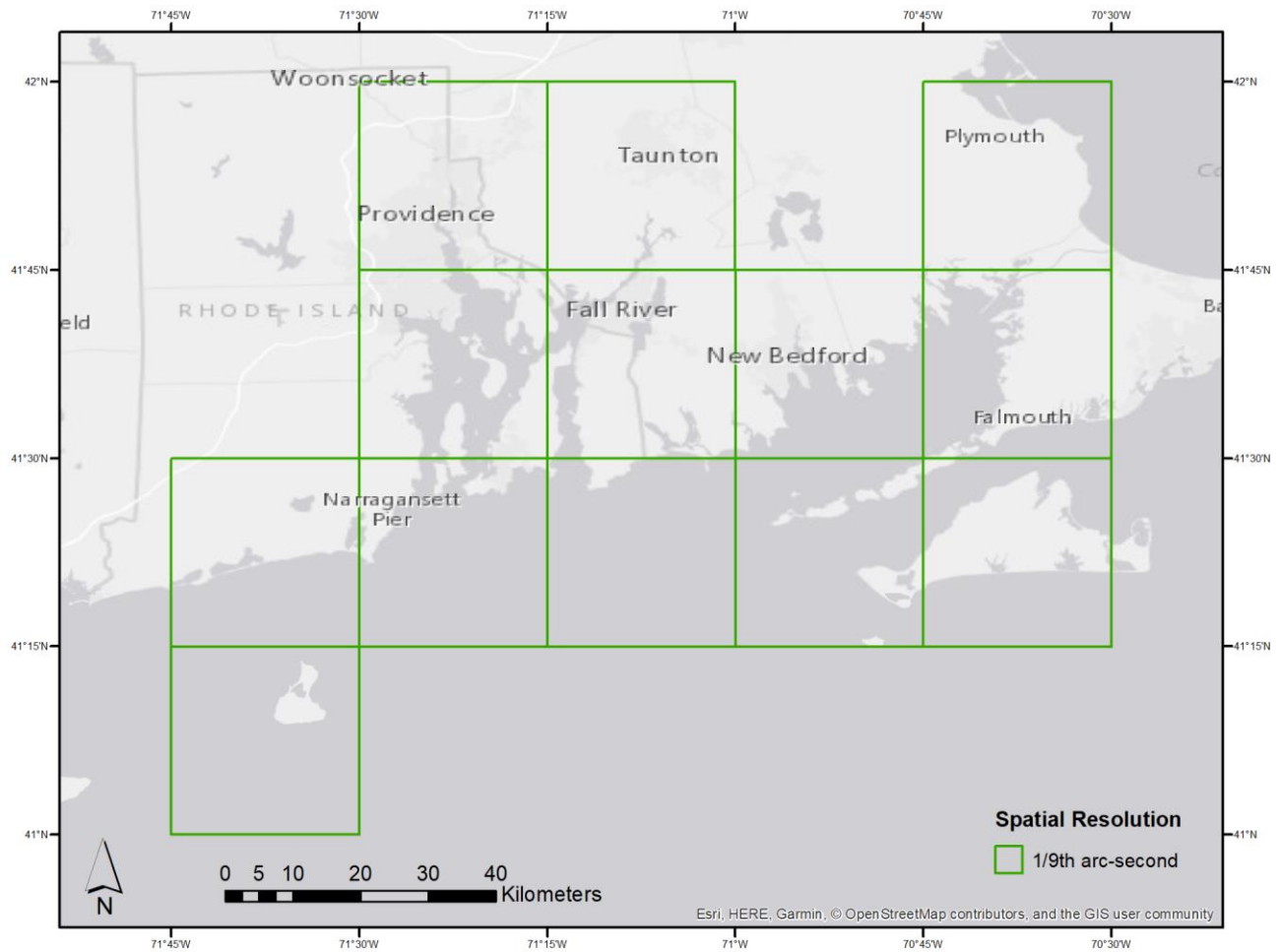
The 1/9 arc-second DEMs cover the coastal area of Rhode Island and Southern Massachusetts including Narragansett Bay and Buzzards Bay. The extents of these DEMs, procedures, data sources, and analysis are described below.

## DEM Specifications

The tiled DEMs were built to the specifications listed in Table 1. Figure 1 shows the 1/9 arc-second tiled DEM boundary in green.

**Table 1. Specifications for the DEMs.**

<i>Grid Area</i>	<i>Rhode Island and Southern Massachusetts</i>
Coverage Area	70.50° to 71.75° W, 41.00° to 42.00° N
Coordinate System	Geographic decimal degrees
Horizontal Datum	NAD 83
Vertical Datum	NAVD 88
Vertical Units	Meters
Cell Size	1/9 arc-seconds



**Figure 1.** Map image of the DEM boundaries for the Rhode Island and Southern Massachusetts tiled DEMs in green.

## Data Sources and Processing

The digital data was downloaded from several sources including U.S. Geological Society (USGS), U.S. Army Corps of Engineers (USACE), NOAA Office of Coastal Management (OCM), NOAA NCEI, the Buzzards Bay National Estuary Program, and the Town of Falmouth, MA.

Bathymetry data used in the compilation of the DEM included NOS hydrographic surveys, NOAA Electronic Navigational Chart (ENC) soundings, USACE harbor survey, and USGS multibeam survey data (Table 2).

**Table 2: Bathymetric data sources used in DEM development.**

<i>Source</i>	<i>Date</i>	<i>Data Type</i>	<i>Spatial Resolution</i>	<i>Horizontal Datum</i>	<i>Vertical Datum</i>
NOAA NOS (Appendix A)	1933 to 2016	Hydrographic survey soundings	50 cm to several km	NAD 83 geographic or NAD 83 UTM Zone 19 North	Mean Lower Low Water (MLLW)
NOAA OCS	1994 to 2017	Extracted chart soundings	1:7,999 to 1:44,999 scale	WGS 84 geographic	MLLW
USACE (Appendix B)	2004 to 2017	Hydrographic condition surveys	1 m	NAD 83 State Plane 2000 or 2001 (survey feet)	MLLW (feet)
Buzzard Bay National Estuary Program	unknown	New Bedford Harbor hydrographic survey compilation	varies	NGVD 29	MLLW (feet)
USGS multibeam: allswathi_5m, mg-2m, fa2011013_2m, bb_bathy5m, 2013-003-FA_Bath5m_MLLW, rb_bathy_1m, vs_bath5m_2m, ei_2hm_nofill	2012 to 2014	Multibeam swath sonar and gridded data compilations	1 m to 5 m	WGS 84 UTM Zone 19	MLLW
Town of Falmouth, MA Green Pond	1999	Bathymetric contours		NAD 27 State Plane 2001 (feet)	NGVD 29

Bathymetric data were transformed to NAD 83 and NAVD 88 as needed and where more recent, higher resolution data existed, older data were edited. NOAA's VDatum tool was used to transform data to NAVD 88. Table 3 lists vertical datum information in the DEM region from NOAA tide stations.

**Table 3: Relationship between vertical datum in DEM region.**

<i>Station ID</i>	<i>8454049</i>	<i>8454000</i>	<i>8452944</i>	<i>8447386</i>	<i>8452660</i>	<i>8447930</i>
	Quonset Point, RI	Providence, Providence River, RI	Conimicut Light, Narragansett Bay	Fall River, Hope Bay	Newport, Narragansett Bay	Woods Hole, Buzzards Bay
MHHW	1.249	1.476	1.398	1.455	1.174	0.672
MHW	1.174	1.401	1.322	1.382	1.099	0.588
NAVD 88	-	0.754	-	0.736	0.622	0.415
MTL	0.611	0.728	0.687	0.717	0.571	0.315
MSL	0.566	0.686	0.642	0.672	0.529	0.300
MLW	0.047	0.055	0.051	0.051	0.042	0.043
MLLW	0.000	0.000	0.000	0.000	0.000	0.000

Table 4 lists the bathymetric-topographic lidar datasets used developing the DEM. The USGS CONED New England DEM was used to provide topographic coverage only where no more recent lidar data were available. CONED DEM bathymetric elevation data were not used in development of the NCEI DEM tiles. NCEI digitized

additional points where features were not resolved in any other data based on surrounding data or when not suitable, from reported information. All source data were converted to a common horizontal of North American Datum of 1983 using a combination of various Geospatial Data Abstract Libraries (GDAL) utilities (using spatial reference information defined by various codes maintained by the European Petroleum Survey Group (EPSG)) and the NOAA VDatum software utility, depending on the dataset in question. The vertical datum of bathymetric datasets referenced to Mean Lower Low Water (MLLW) were converted to the North American Datum of 1988 (NAVD 88; Geoid12A definition) for consistency with topographic data already referenced to NAVD 88. Where VDatum software was not valid, generally up river channels, the surrounding conversion values were extended further upstream to ensure channel elevations below zero. No conversion occurred among topographic datasets referenced to different realizations of NAVD 88 (i.e. defined by different geoid models).

**Table 4: Bathymetric-topographic LiDAR data sources used in DEM development.**

<i>Source</i>	<i>Date</i>	<i>Data Type</i>	<i>Spatial Resolution</i>	<i>Horizontal Datum</i>	<i>Vertical Datum</i>
NOAA NGS: Martha's Vineyard and Nantucket Island	2016	Lidar DEM	1 m	NAD 83 geographic	NAVD 88
USACE NAE: Rhode Island	2015	Lidar DEM	1 m	NAD 83 geographic	NAVD 88
USACE NAE: Massachusetts	2015	Lidar DEM	1 m	NAD 83 geographic	NAVD 88
NGS: Buzzards Bay (Blocks 1, 2, and 3)	2015	Lidar point cloud and DEM	1 m	NAD 83 geographic	NAVD 88
NOAA NGS Coastal Mapping Program Post Sandy: Rhode Island	2014	DEM	1 m	NAD 83 geographic	NAVD 88
USACE NAE: Cuttyhunk, Marshfield, Menemsha	2013	Lidar point cloud		NAD 83 geographic	NAVD 88
USACE NAE: Massachusetts	2013	Lidar point cloud		NAD 83 geographic	NAVD 88
2011 U.S. Geological Survey Topographic LiDAR: LiDAR for the North East	2011	Lidar point cloud		NAD 83 geographic	NAVD 88
USACE Joint Airborne Lidar Bathymetry Technical Center of eXpertise (JALBTCX) Topobathy Lidar: Northeast (MA, ME, NH, RI)	2010	Lidar point cloud		NAD 83 geographic	NAVD 88
USACE Topo/Bathy Lidar: Maine, Massachusetts, and Rhode Island	2005-2007	Lidar point cloud		NAD 83 geographic	NAVD 88
USGS DEM of Black Beach, Falmouth, Massachusetts	2017	DEM	0.5 m	NAD 83 UTM Zone 19 North	NAVD 88
USGS CONED Topobathymetric Model for the New England Region States of New York, Connecticut, Rhode Island, and Massachusetts, 1887 to 2016	2016	DEM	1 m	NAD 83 UTM Zone 18 North	NAVD 88

# DEM Development

All data were converted to a common data format (ASCII xyz) in preparation for gridding. If a dataset was obtained in a raster format, it was resampled using a bilinear resampling algorithm to match the target spatial resolution of 1/9 arc-second, then converted to ASCII xyz using GDAL. All data was reviewed and evaluated for internal and external consistency with adjacent data. Anomalies in were removed through visual inspection and automated filtering.

MB-System's 'mb-grid' utility was used for all gridding processes. A tensioned thin-plate spline algorithm was used to interpolate depth values in pixels within the DEM extent that were unconstrained by elevation measurements. Constrained pixels were assigned a final elevation value based on the Gaussian weighted average of the input source elevation measurements. Gridding weight was modified to Table 5.

**Table 5: Data hierarchy used to assign gridding weight in MB-System.**

<i>Dataset</i>	<i>Relative Gridding Weight</i>
NOAA NGS: Martha's Vineyard and Nantucket Island	1000
2015 USACE NAE: Massachusetts	1000
2015 USACE NAE: Rhode Island	1000
NGS: Buzzards Bay (Blocks 1, 2, and 3)	1000
USGS DEM of Black Beach, Falmouth, Massachusetts	1000
USACE hydrographic condition survey	100
NOS BAGs	100
NOAA NGS Coastal Mapping Program Post Sandy: Rhode Island	100
2011 U.S. Geological Survey Topographic LiDAR: LiDAR for the North East	100
USACE NAE: Cuttyhunk, Marshfield, Menemsha	100
2013 USACE NAE: Massachusetts	100
USACE Joint Airborne Lidar Bathymetry Technical Center of eXpertise (JALBTCX) Topobathy Lidar: Northeast (MA, ME, NH, RI)	10
USACE Topo/Bathy Lidar: Maine, Massachusetts, and Rhode Island	10
USGS multibeam	10
Extracted ENC soundings	10
Green Pond bathymetric contours	10
NCEI digitized lake elevations (elevations based on surrounding data or reported information)	10
NOS non BAG surveys	1
USGS CONED DEM (topography)	1

# Development of MHW DEM

The MHW DEM tiles were developed by generating a conversion grid based on VDatum software. This conversion grid provides complete coverage of the DEM region and was applied to the NAVD 88 DEM to create a MHW version of the DEM tiles.

## DEM Analysis

The completed tiles were reviewed visually for offsets at tile boundaries, gridding artifacts, and interpolation issues. Inconsistencies were evaluated and resolved based on most reliable data available at the time of DEM development. Data were either re-edited, additional information was digitized and added, or both to either resolve features missing in existing data or remove artifacts created. Final DEM tiles were compared to NGS monument data.

## Acknowledgements

Bob Shea, Town of Falmouth, MA for providing Green Pond data. National Oceanic and Atmospheric Administration (NOAA) for providing access to 2014 NOAA Post-Sandy Topobathymetric Lidar. Joint Airborne Lidar Bathymetry Technical Center of eXpertise (JALBTCX) for providing access to USACE NAE 2015 Massachusetts lidar data, and USACE NAE 2015 Rhode Island lidar data.

## Reference

Ackerman, S.D., Brothers, L.L., Foster, D.S., Andrews, B.D., Baldwin, W.E., and Schwab, W.C., 2016, High-resolution geophysical data from the inner continental shelf—South of Martha's Vineyard and north of Nantucket, Massachusetts: U.S. Geological Survey Open-File Report 2016–1168, 21 p., <http://dx.doi.org/10.3133/ofr20161168>.

Ackerman, S.D., Andrews, B.D., Foster, D.S., Baldwin, W.E., and Schwab W.C. 2012, High-resolution geophysical data from the inner continental shelf—Buzzards Bay, Massachusetts: U.S. Geological Survey Open-File Report 2012-1002, [USGS open file report 2012-1002](https://pubs.usgs.gov/of/2012/1002/).

Andrews, B.D., Ackerman, S.D., Baldwin, W.E., Foster, D.S., and Schwab, W.C., 2014, High-resolution geophysical data from the inner continental shelf at Vineyard Sound, Massachusetts (ver. 2.0, September 2014): U.S. Geological Survey Open-File Report 2012-1006, <http://pubs.usgs.gov/of/2012/1006/>.

Eakins B.W., Danielson, J.J., Sutherland, M.G., McLean, S.J., 2015. A framework for a seamless depiction of merged bathymetry and topography along U.S. coasts. Proceedings of the U.S. Hydro Conference (National Harbor, MD, March 16-19), 10p.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2016 NOAA NGS Topobathy Lidar DEM: Martha's Vineyard and Nantucket Island, MA". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2015 NOAA NGS Topobathy Lidar: Buzzards Bay Block 1 (MA)". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2015 NOAA NGS Topobathy Lidar: Buzzards Bay Block2 (MA)". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2015 NOAA NGS Topobathy Lidar: Buzzards Bay Block 3 (MA)". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2013 USACE NAE Topobathy Lidar: Cuttyhunk, Marshfield, Menemsha, Nantucket (MA)". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2013 USACE NAE Topobathy Lidar: Massachusetts". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2013-2014 U.S. Geological Survey CMGP LiDAR: Post Sandy (MA, NH, RI)". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2011 U.S. Geological Survey Topographic LiDAR: LiDAR for the North East". Charleston, SC: NOAA Office for Coastal Management. Accessed September 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2010 USACE NCMP Topobathy Lidar: Northeast Atlantic Coast". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer. Custom processing of "2007 USACE NCMP Topobathy Lidar: New England". Charleston, SC: NOAA Office for Coastal Management. Accessed June 2018 at <https://coast.noaa.gov/dataviewer>.

Pendleton, E.A., Andrews, B.D., Danforth, W.W., and Foster, D.S., 2014, High-resolution geophysical data collected aboard the U.S. Geological Survey research vessel Rafael to supplement existing datasets from Buzzards Bay and Vineyard Sound, Massachusetts: U.S. Geological Survey Open-File Report 2013–1020, 6 p., [USGS open file report 2013-1020](#).

Pendleton, E.A., Twichell, D.C., Foster, D.S., Worley, C.R., Irwin, B.J., and Danforth, W.W. 2011, High-resolution geophysical data from the sea floor surrounding the Western Elizabeth Islands, Massachusetts: U.S. Geological Survey Open-File Report 2011-1184, 1 DVD-ROM. (Also available at <https://pubs.usgs.gov/of/2011/1184/>.)

Sturdivant, E.J., Thieler, E.R., Lentz, E.E., Remsen, D.P., and Miner, Simon, 2017, Topographic, imagery, and raw data associated with unmanned aerial systems (UAS) flights over Black Beach, Falmouth, Massachusetts on 18 March 2016: U.S. Geological Survey data release, [USGS UAS data Falmouth MA data release](#).

Turecek, A.M., Danforth, W.W., Baldwin, W.E., and Barnhardt, W.A., 2012, High-resolution geophysical data collected within Red Brook Harbor, Buzzards Bay, Massachusetts, in 2009: U.S. Geological Survey Open-File Report 2010-1091, at <https://pubs.usgs.gov/of/2010/1091/>.

VDatum 3.8 - Maine/New Hampshire/Massachusetts - Gulf of Maine, Version 1.3 (2017). <https://vdatum.noaa.gov/welcome.html> [July 2018].

VDatum 3.8 - New York/Connecticut/Rhode Island – Outer NY Bight, eastern Long Island Sound, Block Island Sound, Version 2.2 (2017). <https://vdatum.noaa.gov/welcome.html> [July 2018].



# Appendix A: NOS Surveys

<i>Survey ID</i>	<i>Date</i>
F00345	1990
F00348	1990
F00360	1991
F00363	1991
F00364	1991
F00365	1991
F00367	1991
F00368	1992
F00372	1992
F00373	1992
F00374	1992
F00375	1992
F00376	1992
F00378	1992
F00379	1992
F00406	1994
F00411	1995
F00491	2002
F00498	2004
F00522	2006
F00559	2008
F00642	2015
F00643	2014
F00644	2014
H05344	1933
H05553	1935
H05554	1934
H05621	1934
H05622	1935
H05628	1935
H05629	1934
H05630	1935
H05880	1935
H05881	1936
H05882	1935
H05883	1935
H06329	1938
H06330	1938
H06331	1938
H06348	1938
H06349	1942
H06350	1942
H06442	1939
H06443	1939

<i>Survey ID</i>	<i>Date</i>
H06444	1939
H06445	1939
H06446	1939
H06447	1939
H06468	1942
H06469	1942
H06528	1939
H06532	1939
H06533	1942
H06561	1940
H06562	1940
H06563	1940
H06668	1941
H06742	1942
H06859	1943
H06970	1944
H07640	1948
H07790	1949
H07939	1951
H08164	1955
H08165	1955
H08166	1955
H08170	1954
H08207	1955
H08313	1963
H08314	1956
H08315	1956
H08316	1956
H08366	1963
H08367	1963
H08394	1963
H08395	1957
H08396	1957
H08397	1957
H08503	1959
H08615	1963
H08616	1961
H08820	1964
H08821	1964
H08846	1965
H08847	1965
H08902	1966
H08903	1966
H08904	1966
H08905	1966
H09013	1968

<i>Survey ID</i>	<i>Date</i>
H09152	1970
H09170	1970
H09554	1975
H09615	1976
H09628	1977
H09644	1976
H09645	1976
H09646	1977
H09647	1976
H09661	1976
H09668	1977
H09669	1977
H09712	1977
H09724	1977
H10350	1990
H10378	1991
H10404	1991
H10422	1992
H10424	1991
H10434	1993
H10458	1993
H10461	1993
H10496	1993
H10504	1994
H10511	1993
H10520	1994
H10530	1994
H10547	1994
H10548	1994
H10556	1994
H10563	1994
H10575	1995
H10605	1995
H10616	1995
H10628	1995
H10633	1995
H10641	1995
H10648	1995
H10654	1995
H10659	1996
H10711	1996
H10720	1996
H10772	1997
H10788	1997
H10795	1999
H10914	2000

<i>Survey ID</i>	<i>Date</i>
H11076	2004
H11077	2001
H11310	2004
H11318	2004
H11319	2004
H11320	2004
H11321	2004
H11322	2004
H11346	2004
H11695	2007
H11920	2008
H11921	2008
H11922	2008
H11929	2008
H11930	2011
H11988	2009
H11995	2008
H11996	2008
H12009	2009
H12010	2009
H12011	2009
H12015	2009
H12023	2009
H12033	2009
H12082	2011
H12083	2009
H12137	2009
H12139	2009
H12153	2009
H12296	2011
H12324	2011
H12386	2011
H12429	2013
H12430	2012
H12431	2012
H12700	2014
H12707	2014
H12801	2015
H12802	2015
H12811	2015
W00313	2016
W00318	2010

# Appendix B: USACE Surveys

<i>Survey ID</i>		<i>Date</i>	<i>Original Horizontal Datum</i>	<i>Original Vertical Datum</i>
APP17	Apponaug Cove	2015	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
GSP183	Block Island (Great Salt Pond)	2017	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
BHR244, HBR2444	Block Island Harbor of Refuge	2017	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
BPC263, BPC265	Bullocks Point Cove (2)	2014 2016	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
COA1	Coasters Island Harbor	2013	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
GRB	Greenwich Bay	2008	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
LNB613, LNB616	Little Narragansett Bay and Watch Hill Cove	2013 2015	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
NPT219	Newport Harbor	2010	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
OKL11	Oakland Beach	2007	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
PAW611	Pawcatuck River	2009	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
PWT33	Pawtuxet Cove	2017	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
PJH225, PJH228, PJH231	Point Judith Pond and Harbor of Refuge	2011	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
POT1	Potowomut River	2004	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
PRO485	Providence River and Harbor	2015	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
SAH	Sakonnet Harbor	2012	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
SAR	Sakonnet River	2008	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
SEE197	Seekonk River	2012	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
WAR3	Warren River	2012	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
WWC20	Warwick Cove	2016	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
WIC142	Wickford Harbor	2010	NAD 83 State Plane Rhode Island 3800 (feet)	MLLW (feet)
BUT1224	Buttermilk Bay Channel	2014	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
CAN230	Canapitsit Channel	2012	NAD 83 State Plane 2002 (survey feet)	MLLW (feet)
MA_36_CCC_20170115	Cape Cod Canal (2 files)	2017	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
CUT231	Cuttyhunk Harbor	2013	NAD 83 State Plane 2002 (survey feet)	MLLW (feet)
EDG143	Edgartown Harbor	2015	NAD 83 State Plane 2002 (survey feet)	MLLW (feet)
FLR283	Fall River Harbor	2012	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)

<i>Survey ID</i>		<i>Date</i>	<i>Original Horizontal Datum</i>	<i>Original Vertical Datum</i>
FAL27	Falmouth Harbor	2013	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
LWH155	Little Harbor Woods Hole	2007	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
MEN60	Menemsha Creek	2017	NAD 83 State Plane 2002 (survey feet)	MLLW (feet)
NBH354	New Bedford and Fairhaven Harbor	2015	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
OAK2	Oak Bluffs Harbor	2015	NAD 83 State Plane 2002 (survey feet)	MLLW (feet)
CCC1223	Onset Bay	2013	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
TAU144	Taunton River	2001	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
VIN141	Vineyard Haven Harbor	2009	NAD 83 State Plane 2002 (survey feet)	MLLW (feet)
WAH15	Wareham Harbor	2017	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
WER22	Westport River and Harbor	2009	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)
WOO154	Woods Hole Channel	2007	NAD 83 State Plane 2001 (survey feet)	MLLW (feet)